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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.

EXAMINER	
ART UNIT	PAPER NUMBER

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/293,188	Applicant(s) Yin et al.
	Examiner Phat X. Cao	Group Art Unit 2814

☐ Responsive to communication(s) filed on _____.

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

X Claim(s) *1-16* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

X Claim(s) *7, 8, 15, and 16* is/are allowed.

X Claim(s) *1-3, 6, 9-11, and 14* is/are rejected.

X Claim(s) *4, 5, 12, and 13* is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

X See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

X Notice of References Cited, PTO-892

X Information Disclosure Statement(s), PTO-1449, Paper No(s). *6, 7*

☐ Interview Summary, PTO-413

X Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Claim Objections

1. Claim 4 is objected to because of the following informalities:

in claim 4, lines 4-5, "; and" should be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 6, 9-11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al (US. 5,780,908) in view of Hong et al (US. 6,077,774).

With respect to claims 1-3, and 9-11, Sekiguchi et al disclose in Fig. 3(b) a semiconductor structure comprising: an electrically conductive interconnect disposed within a first dielectric layer 4, the electrically conductive interconnect having an upper surface and including: a titanium/titanium nitride bilayer film 6 disposed within a depression in the first dielectric layer 4; a tungsten film 7 disposed upon the titanium/titanium nitride bilayer film 6 and filling the depression; a first passivation layer 7b of tungsten nitride layer, disposed upon the upper surface, the first passivation layer 7b formed by exposing the surface of the electrically conductive

interconnect 7 to plasma and nitriding an area in the vicinity of the surface of the electrically conductive interconnect 7 (column 12, lines 30-37).

Sekiguchi et al do not disclose an ILD disposed upon the first dielectric layer 4 and being continuously adhered to the upper surface.

However, Hong et al teach in Fig. 1F the obviousness of forming an ILD 36 upon the dielectric layer 12 and continuously adhered to the upper surface of the electrically conductive interconnect 30. Accordingly, it would have been obvious to form an ILD upon the dielectric layer 4 and continuously adhered to the upper surface of the electrically conductive interconnect 7 of Sekiguchi, because the ILD would provide the known purpose of isolating and protecting the electrically conductive interconnect from the outside ambient.

Note that process limitations in claims 1 and 9 (forming by chemical reaction products and solid mixtures, etc.), do not carry weight in a claim drawn to structure. In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

With respect to claims 6 and 14, Sekiguchi et al do not disclose the first passivation layer 7b having a thickness of less than 50 angstroms. However, it would have been obvious to form the first passivation layer 7b with the thickness as set forth above, because the thickness of the first passivation layer is not critical, it can be optimized during routine experimentation.

4. Claims 1-3, 6, 9-11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekiguchi et al (US. 5,780,908) in view of Liao (US. 6,114,238).

With respect to claims 1-3 and 9-11, as discussed above, Fig. 3(b) of Sekiguchi et al substantially reads on the above claims, except it does not disclose an ILD disposed upon the first dielectric layer and being continuously adhered to the upper surface of the conductive interconnect.

However, in view of Fig. 1 of Liao, it would have been obvious to form an ILD upon the dielectric layer 4 and continuously adhered to the upper surface of the conductive interconnect 7 of Sekiguchi, because the ILD would provide the known purpose of isolating and protecting the electrically conductive interconnect from the outside ambient.

With respect to claims 6 and 14, Liao further teaches in column 2, lines 38-40 the obviousness of forming a passivation layer upon the upper surface of the electrically conductive interconnect with a thickness of 50 angstroms. Accordingly, it would have been obvious to form the first passivation layer 7b with the thickness as set forth above, because the thickness is not critical, it can be optimized during routine experimentation.

5. Claims 1 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liao (US. 6,114,238).

Liao discloses in Fig. 1 a conventional semiconductor structure comprising: an electrically conductive interconnect disposed within a first oxide layer 102, the electrically conductive interconnect having an upper surface; and an ILD 108 of oxide disposed upon the first dielectric layer 102 and upon the upper surface, the ILD 108 being continuously adhered to the upper surface.

Fig. 1 of Liao does not disclose a first passivation layer disposed upon the upper surface of the electrically conductive interconnect. However, Fig. 2D of Liao further discloses the obviousness of forming a first passivation layer 212a upon the upper surface of the electrically conductive interconnect by exposing the surface of the electrically conductive interconnect to plasma and nitriding an area in the vicinity of the surface of the electrically conductive interconnect 208 (column 2, lines 33-44) for the purpose of preventing short circuit which is provided by metal diffusing into the intermetal dielectrics (column 1, lines 41-45).

Note that process limitations in claims 1 and 9 (forming by chemical reaction products and solid solution mixtures, etc.), do not carry weight in a claim drawn to structure. In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

Allowable Subject Matter

6. Claims 4-5 and 12-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to disclose all the limitations recited in the above claims, including the limitation of having a layer upon the upper surface of the electrically conductive interconnect comprising ammonia and its derivatives that is adsorbed upon the upper surface.

7. Claims 7-8 and 15-16 are allowed because of the same reasons above.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (703) 308-4917. The Examiner can normally be reached on Monday through Thursday. If attempts to reach the Examiner by telephone are unsuccessfully, the Examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. Group 2800 fax number is (703) 308-7722 or (703) 308-7724.

PC
February 23, 2001

Cao, Phat X.
Patent Examiner
Technology Center 2800